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ABSTRACT

Performance objectives are stated for this secondary school unit prepared for the Dade County Florida Quinmester Program. The unit examines scientific method, biological classification, evolution, population ecology, and pays attention to problems of the human environment. The booklet lists related state-adopted textbooks, cites descriptions of teaching and laboratory activities in these texts, lists films available from the county audio-visual library, recommends 39 books useful for reference, suggests possible student projects and topics for written reports, and provides questions for class discussion. A chart relating the performance objectives to the suggested activities is appended. (AL)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

Science: MAN AND NATURE 5314.10

DADE COUNTY PUBLIC SCHOOLS
DIVISION OF INSTRUCTION • 1971

MAN AND NATURE

5314.10

SCIENCE

(Experimental)

Written by Nancy D. McCarthy
and Barbara A. Silver

for the

DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida
1971

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MAN AND NATURE

COURSE DESCRIPTION

This is a survey course in which the student will have the opportunity to:

1. Examine the scientific method as a tool used by man to find out about himself and nature.

2. Investigate biological classification as a means of organizing the diverse living organisms in his world.

3. Explore evolution as an explanation of the diversity of life forms.

4. Study the characteristics of populations, societies, and communities.

5. Focus his attention on the current state of his environment and its problems.

ENROLLMENT GUIDELINES

This course is strongly suggested for college bound students and those who desire one credit in biology. There are no pre- or corequisites.

STATE ADOPTED TEXTS

1. Biological Sciences Curriculum Study Committee. Biological Science: An Inquiry Into Life. 2nd ed. New York: Harcourt, Brace and World, 1968 (Yellow Version)

2. Biological Sciences Curriculum Study Committee. Biological Science: Molecules to Men, 2nd ed. Boston: Houghton Mifflin Company, 1968. (Blue Version)

3. Biological Sciences Curriculum Study Committee. High School Biology: BSCS Green Version, 2nd Ed., Chicago: Rand McNally and Co., 1968.

* 4. Otto, James H. and Towle, Albert. Modern Biology New York: Holt, Rinehart and Winston, Inc., 1965.

* 5. Weinberg, Stanley L., Biology, Atlanta: Allyn and Bacon, Inc., 1966.

PERFORMANCE OBJECTIVES

THE STUDENT WILL:

1. Apply the scientific method to problem situations.

2. Propose reasons for the use of any classification system.

3. Devise a classification system for a given group of diverse organisms.

4. Specify the limitations implied by the term species.

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* Off adopted list, 1971.

PERFORMANCE OBJECTIVES (CONT'D)

5. Relate the structure of the modern classification system to its role in biological science.

6. Identify characteristics and representative organisms from a given selection of phyla.

7. Analyze problems involved with the change of living things through time using the ideas of Lamarck and Darwin.

8. Explain the term adaptation as it applies to the modern concept of evolution.

9. Describe the sources of evidence which support the theory of evolution.

10. Relate the structure of a population to its function in the biosphere.

11. Describe the composition of a society.

12. Relate the concepts of territory, dominance, peck order and social hierarchy to the function of a society.

13. Describe the composition of a biological community.

14. Compare the various kinds of biological communities.

15. Describe the nutritional relationships among the individuals in a biological community.

16. Relate the process of biological succession to the development of a climax community.

17. Relate the physical and biological factors that make up an ecosystem.

18. Evaluate man's role in the future of the environment.

PERFORMANCE OBJECTIVES (CONT'D)

19. Describe specific environmental problems facing man today.

20. Cite ways in which each indivudual may take steps to improve his environment.

COURSE OUTLINE

I. The Scientific Method

II. Classifying Living Things

A. Development of classification systems

B. Problems in classification

C. Survey of living things
1. Protista
2. Plants
3. Animals

III. Evolution

A. Views before Darwin

B. Charles Darwin

C. Natural selection and adaptation
1. Theory of evolution and biological variety
2. Examples of natural selection
3. Sources of evidence for evolution

IV. Populations

A. Characteristics of populations

B. Populations and the environment

V. Societies

A. Structure of societies

COURSE OUTLINE (CONT'D)

B. Problems of societies

VI. Communities

A. Structure of a community
   1. Composition of a biological community
   2. The types of communities
   3. Nutritional relationships within a community
   4. Biological succession and climax communities

B. The Ecosystem
   1. Physical and biological factors
   2. Ecocycles
      a. Water cycle
      b. Nitrogen cycle
      c. Carbon cycle

VII. Environmental Science

A. The role of man in the environment

B. Environmental problems
   1. Problems of population
   2. Problems of pollution
   3. Conservation of natural resources

EXPERIMENTS

Biological Sciences Curriculum Study Committee. Biological Science: An Inquiry Into Life - Student Laboratory Guide. 2nd ed. New York: Harcourt, Brace and World, Inc., 1968 (Yellow Version)

1. A Plant-Animal? (Inquiry 12-1, p. 82)
2. Comparison of Plants - Simple or Complex? (Inquiry 13-1, p. 85)
3. A Simple Key to Flowering Plants (Inquiry 17-2, p. 111)
4. Animal Classification (Inquiry 19-1, p. 136)
5. Biological Succession (Inquiry 36-1, p. 218)
6. Producers in an Ecosystem (Inquiry 37-1, p. 222)
7. Consumers in an Ecosystem (Inquiry 37-2, p. 227)

Biological Sciences Curriculum Study Committee. Biological Science: Molecules To Man. 2nd ed. Boston: Houghton Mifflin Company, 1968 (Blue Version)

8. Investigating Unknown Substances (Ex. 1-4, p.4)
9. Investigating Measurement (Ex. 1-8, p. 11)
10. Investigating a Scientific Problem (Ex. 1-12, p. 18)
11. Investigating and Classifying Various Living Things (Ex. 2-5, p. 43)
12. Investigating Variation Within A Species (Ex. 3-4, p. 70)
13. Investigating Natural Selection (Ex. 3-9, p. 77)
14. Investigating the Sampling of Populations (Ex. 27-2, p. 680)
15. Investigating Human Population in the United States (Ex. 27-6, p. 687)
16. Investigating the Effect of Crowding on a Population (Ex. S-19, p. 776)
17. Investigating the Pathways of a Food Chain (Ex. S-20, p. 778)

Otto, James H., Towle, Albert and Crider, Elizabeth H., Biology Investigations. New York: Holt, Rinehart and Winston, Inc., 1965.

EXPERIMENTS (CONT'D)

18. Variations in Organisms (Ex. 13-1, p. 97)
19. A Study of Classification (Ex. 14-1, p. 99)
20. The Water Cycle (Ex. 48-1, p. 329)
21. The Carbon-Oxygen Cycle (Ex. 48-2, p.333)
22. Nutritional Relationships (Ex. 49-1, p. 337)
23. Ecological Analysis of Two Habitats (Ex. 49-2, p. 341)
24. Life in Soil Communities (Ex. 49-3, p. 343)
25. Succession (Ex. 51-1, p. 345)

Biological Sciences Curriculum Study Committee. High School Biology: BSCS Green Version. 2nd ed. Chicago: Rand McNally and Company, 1968. (Green Version)

26. Interrelationship of Producers and Consumers (Ex. 1.5, p. 26)
27. Population Growth: A Model (Ex. 2.1, p. 43)
28. Population Changes in Open Systems (Ex. 2.3, p.62)
29. Study of a Biotic Community (Ex. 3.1, p. 76)
30. Abiotic Environment: A Comparative Study (Ex. 3.2, p. 98)
31. The Levels of Classification (Ex. 4.1, p. 108)
32. Structural Characteristics in the Identification of Animals (Ex. 4.2, p. 139)
33. Diversity in the Animal Kingdom: A Comparative Study (Ex. 4.3, p. 147)
34. Diversity in Angiosperm Leaves (Ex. 5.1, p. 164)
35. A Study of Environmental Tolerance (Ex. 81., p. 254)
36. Temperature, Rainfall, and Biome Distribution (Ex. 8.2, p. 282)
37. Effects of Fire on Biomes (Ex. 8.3, p. 296)
38. Succession in a Freshwater Ecosystem (Ex. 9.1, p. 312)
39. A Method for Studying Territorality (Ex. 15.3, p. 561)

PROJECTS

Students may:

1. Put together bulletin board displays showing the scientific method in action.

2. Make collections of various plant or animal groups and give biological classification for each.

3. Do posters comparing Darwin's and Lamarck's explanations for how giraffes got long necks.

4. Establish and maintain some biological grouping as a population of mice, an ant colony (society) or an aquarium or terrarium (community).

5. Maintain an "environmental crisis" notebook, consisting of clippings from magazines, newspapers, etc., dealing with environmental problems.

6. Investigate local environmental problems and present displays and demonstrations.

7. Establish an ecology or environment club for the purpose of maintaining and improving local conditions in and around the school and community.

8. Investigate the laws which attempt to control pollution in this area. Determine whether these laws are being successfully enforced.

REPORTS

1. Biographical reports on such men as

   a. John Ray
   b. Linnaeus
   c. Charles Darwin
   d. Alfred R. Wallace
   e. Jean Baptiste Lamarck
   f. Charles Lyell
   g. Thomas Malthus

2. Research reports on the evolution of a modern classification system.

3. Research reports on the various sources of evidence for evolution such as

   a. Fossils
   b. Geographical distributions
   c. Embryology
   d. Comparative anatomy
   e. Comparative biochemistry

4. Students may do research reports on any particular type of biological society or community.

5. Students may read any of the current books on the environmental problems and then do oral or written reports (or both).

RELATED PROBLEMS

1. Mathematical analysis of experimental data.

2. Techniques of fossil dating.

3. Population mechanics.

DADE COUNTY 16mm FILMS

1. Characteristics of Plants and Animals
   AV#1-02215, 10', C

2. Camouflage in Nature Through Form and Color Matching, AV#1-02655, 11' C

3. Amoeba, The
   AV#1-02717, 10', BW

4. Algae
   AV#1-11117, 16', C

5. Arachnids
   AV#1-02740, 10', BW

6. Arthropods: Insects and Their Relatives
   AV#1-02736, 11', C

7. Bacteria
   AV#1-30665, 28', BW

8. Bacteria, A Laboratory Study
   AV#1-11118, 15', C

9. Fungi
   AV#1-11114, 15', C

10. Gulf of Mexico Invertebrates
    AV#1-02704, 15', C

11. How Living Things Change
    AV#1-02221, 11', C

12. Introducing the Reptiles
    AV#1-11183, 17', BW

13. Invertebrates, The
    AV#1-11145, 14', BW

14. Lichens and Mosses
    AV#1-11113, 22', C

15. Mollusks, The
    AV#1-11149, 14', BW

FILMS (CONT'D)

16. Orders of Insects
AV#1-30704, 30', C

17. Reptiles and Their Characteristics
AV#1-02865, 11', C

18. Simple Plants, Algae and Fungi
AV#1-11115, 14', C

19. Simple Plants, Bacteria
AV#1-11120, 14', C

20. Sponges and Coelenterates
AV#1-02172, 11', BW

21. Virus
AV#1-30533, 28', BW

22. Water and Life
AV#1-11054, 15', C

23. Adaptations in Plants
AV#1-11107, 15', C

24. Adaptations in Plants and Animals
AV#1-11059, 13', C

25. Darwin and Evolution
AV#1-30553, 28', C

26. Dinosaurs
AV#1-30673, 28', C

27 Evolution of Man
AV#1-30389, 28', C

28 From Water To Land
AV#1-30548, 28', C

29 Mimicry and Other Evidence
AV#1-30494, 28', C

30 Natural Selection and Adaptation
AV#1-30563, 28', C

FILMS (CONT'D)

31. Rocks and the Record
AV#1-30349, 28', C

32. Species: Stability and Change
AV#1-30543, 28', C

33. Systematics and Plant Evolution
AV#1-30644, 28', C

34. Balance in Nature
AV#1-11141, 17', C

35. Honeybee, The
AV#1-11174, 14', C

36. Ladybird Story, The
AV#1-02775, 11', C

37. Population Ecology
AV#1-30489, 28', C

38. Secrets of the Plant World
AV#1-11096, 13', C

39. Water Birds
AV#1-30705, 32', C

40. Realm of the Honeybee
AV#1-40037, 60', BW

41. Secrets of the Ant and Insect World
AV#1-11157, 13', C

42. Secrets of the Bee World
AV#1-11175, 13', C

43. Termites
AV#1-11165, 23', BW

44. Beaver Valley
AV#1-02494, C

45. Above the Timberline
AV#1-11069, C

FILMS (CONT'D)

46. Water and Life on Earth
AV#1-01807, 11', C

47. Succession From Sand Dune To Forrest
AV#1-11108, 16', C

48. Spring Comes To The Subartic
AV#1-12650, 15', C

49. Secrets of the Underwater World
AV#1-11144, 16', C

50. Realm of the Wild
AV#1-30686, 30', C

51. Partnerships Among Plants and Animals
AV#1-02657, 11', C

52. Between the Tides
AV#1-11071, 20', C

53. Birth of a Florida Key
AV#1-12252, 18', C

54. Changing Forest, The
AV#1-11496, 19', C

55. Forest Grows, The
AV#1-03740, 10', C

56. Interrelationships for Survival
AV#1-30558, 28', C

57. Life in the Desert
AV#1-02393, 11', C

58. Life in the Forest
ZV#1-03755, 11' , C

59. Life in the Grasslands
AV#1-02217, 11', C

60. Marine Animals of the Open Coast
AV#1-11075, 22', C

FILMS (CONT'D)

61. Nature's Half Acre
AV#1-30404, 33', C

62. Nitrogen Cycle
AV#1-11093, 14', BW

63. Olympic Rain Forest
AV#1-03757, 11', C

64. Insect Enemies and Their Control
AV#1-02765, 11', C

65. Natural Enemies of Insect Pests
AV#1-30703, 27', C

66. What is Ecology?
AV#1-11064, 11', C

67. Adventure in Conservation
AV#1-10218, 13', C

68. Breaking The Web
AV#1-00421, 11', C

69. Colorado River
AV#1-04979, 14', BW

70. Conservation of Natural Resources
AV#1-00409, 11', BW

71. Enchanted Key
AV#1-02947, 10', C

72. Enduring Wilderness
AV#1-30791, 27', C

73. Engineering Your Health
AV#1-10329, 14', C

74. Everyman's Empire
AV#1-10329, 14', C

FILMS (CONT'D)

75. Forest Murmurs
AV#1-00952, 10', C

76. Forest Conservation
AV#1-03744, 10', C

FILM LOOPS

1. Adaptation to Environment, 4 loop set Ealing
Cat. No. 89-3149/1

2. Algae Bloom, Ealing
Cat. No. 81-6520

3. Algae Bloom, Ealing
Cat. No. 81-6538

4. American Mountain Animals, Ealing
Cat. No. 81-8005

5. Arachnids, Ealing
Cat. No. 81-6777

6. Cat Family: Part I., Ealing
Cat. No. 81-9870

7. Cat Family: Part 2, Ealing
Cat. No. 81-9888

8. Coelenterates, Ealing
Cat. No. 81-6744

9. Duck-Bill Platypus, Ealing
Cat. No. 81-8930

10. Duck-Bill Platypus: Mother and Babies, Ealing
Cat. No. 81-8948

11. Echinoderms, Ealing
Cat. No. 81-5779

FILM LOOPS (CONT'D)

12. Investigating Territorial Behavior, Ealing
Cat. No. 81-6926

13. Pouched Animals and Their Young, Ealing
Cat. No. 81-8922

14. Territorial Behavior: Fish, Ealing
Cat. No. 81-3253

DISCUSSION QUESTIONS

1. How can the scientific method be applied to everyday problem situations?

2. How has the modern classification system developed over the years?

3. Compare the explanations of evolution as offered by Lamarck and Darwin.

4. How do we know that evolution or change has occurred and how do we know why certain organisms should occupy the same taxonomic category?

5. How do populations, societies and communities relate with one another in the biosphere?

6. How does a biological succession occur?

7. How has man influenced his environment?

8. How can man return the "balance" to nature?

ADDITIONAL INNOVATIVE ACTIVITIES

1. Use the Life Reprint #36, Evolution, Darwin Discovers Nature's Plan as preparatory reading on evolution.

2. The Life Filmstrip Series, The Animal Kingdom (4 strips); Darwin's World of Nature, (9 strips); and The World We Live In, (8 strips) are not available from the county but are inexpensive (approx. $5) and could perhaps be bought with fee money.

3. Ecology, Environment, and Organism Survey Slides are available from J. Weston Walsh Co. These are current and could be used to supplement films and other visuals.

4. The Invitations to Inquiry, Group 1 in the Biology Teacher's Handbook (Schwab, John Wiley and Sons, Inc., New York) may be used as an independent series of learning experiences.

5. Students may be asked to do abstracts of Scientific American offprints or articles.

6. Subscriptions to Science World or other similar publications could be used for very current information on our environmental crisis.

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* Books marked with an asterick are available in paperbacks

MASTER SHEET - MAN AND NATURE

Objective	Laboratory Investigations	Student Text References	Supplementary References	Films	Film Loops	Demonstrations	Film Strips	Transparencies	Discussions	Additional Activities
1	8, 9, 10	1-Ch. 1; 2-Ch. 1; 4-Ch. 1; 5-Ch. 1	5, 26						1	
2	29, 30, 31	1-Ch. 19; 2-Ch. 2; 4-Ch. 4; 5-Ch. 7	16, 35						2	
3	2, 29, 30, 32	2-Ch. 2; 3-Ch. 4; 4-Ch. 14								
4		1-Ch. 19; 2-Ch. 2; 3-Ch. 4; 5-Ch. 7		32						
5	1, 3, 4, 17	1-Ch. 19; 2-Ch. 2; 3-Ch. 4; 5-Ch. 7	14		9, 10					
6	3, 4, 11, 31, 32	1-pp. 762-819 2-pp. 54-63 2-Appendix J 3-Appendix II 3-Ch. 4 5-Ch. 8, 9, 10	25	1,3,4, 5,6,7, 8,9,10 12,13, 14,15, 16,17, 18,19, 20,21	4, 5, 6, 7, 8, 11, 13					
7	13	1-Ch. 31; 2-Ch. 3; 3-Ch. 18; 4-Ch. 13; 5-Ch. 22	6, 7, 8, 17 18, 23	11, 22 25					3	
8	12, 16	1-Ch. 31; 2-Ch. 3; 3-Ch. 18; 4-Ch. 13; 5-Ch. 22	34, 35	2, 23, 24,30, 38	1				4	
9		1-Ch. 31; 2-Ch. 3; 3-Ch. 18; 4-Ch. 13; 5-Ch. 7	19, 20, 24, 30							
10	14, 15, 16; 25, 26	2-Ch. 27; 3-Ch. 2	2, 3, 4, 10 36	37						
11		2-Ch. 28; 3-Ch. 15; 4-Ch. 32; 5-Ch. 11	10, 22	34, 40 41, 42 43					5	
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MASTER SHEET - MAN AND NATURE (con't)

Objective	Laboratory Investigations	Students Text References	Supplementary References	Films	Film Loops	Demonstrations	Film Strips	Transparencies	Discussions	Additional Activities
18	15	1-Ch. 38; 3-Ch. 20; 4-Ch. 53; 5-Ch. 31		66, 67, 68, 69, 70						
19	16	1-Ch. 38; 3-Ch. 1,20 4-Ch. 52,53 5-Ch. 28,31	9, 11, 12, 13, 21, 31, 32, 37, 39	46, 64, 65	2,3				7	
20		1-Ch. 38; 3-Ch. 20; 4-Ch. 53 5-Ch. 28,31	33, 38	34, 36, 70, 71, 72, 73, 74, 75, 76					8	